CHAPTER II

Climate Action Plan 2050 as Paris Agreement Adaptation

In 2015, the Paris Agreement as the latest international agreement on climate change has been taken place at the COP 21 in Paris, before the ratification of Paris Agreement, the COP 15 at Copenhagen in 2009 has been known as "the low history of climate change action" due to there is no legal agreement on climate mitigation after the failure of the Kyoto Protocol. Before 30 November 2015, starting from 8 to 10 November 2015, there was a meeting to prepare the specific topics and agenda that should focus at the COP 21 attended by the minister from 60 countries. At the COP 21 that started on 30 November 2015, the actors including governments, business leaders and Non-Government Organization (NGO) attended the meeting and have been prepared the specific target and agenda on the Paris Agreement reflected by the experience of Copenhagen Conference. Therefore, the ratification of the Paris Agreement by 196 parties which are 195 countries and the European Union was the turning point of climate change as one of the most critical environment destruction.[34]

There are 196 parties including developed and developing countries committed to reduce the greenhouse gas emission as the prominent cause of climate change. Each country that has been ratified Paris Agreement committed to achieving the Temperature Goal to hold the global world temperature below than 2

[34] Daniel Klein, Maria Pia Carazo, et all, *The Paris Agreement on Climate Change*, (United Kingdom : University of Oxford Press, 2017), Page 18

degree Celsius and pursuing the effort to limit the increase of world temperature averages 1.5 degrees Celsius above pre-industrial levels.[35] As stated on the two articles of Paris Agreement *"global warming goal of well below 2 degrees Celsius on pre-industrial averages and defines a universal, legal framework to strengthen the global response to the threat of climate change"*.[36] Through the two articles of the Paris Agreement, 196 Parties ratified the agreement agreed to reduce the further risks and impacts of climate change by strengthening the global response to overcome climate change threats.

Paris Agreement also highlights the Net Zero Emission which mentions the target of the elimination of greenhouse gas emission until 100% in 2050 while United Nations Environment Programme (UNEP) targeted on Net Zero Emission will be achieved in 2070. The target of greenhouse gases reduction on Paris Agreement will be focus on the emission of CO_2 from the burning of fossil fuels following with others emission from human activities including N_2O and CH_4.[37] As stated on the article 4 (1) *"Each parties that had ratified Paris Agreement should contribute to reaching global peaking greenhouse gas emission as soon as possible and removals the greenhouse gases on the second half of this century*".[38] Paris Agreement is expected the reduction of greenhouse gases emission around 55 $GtCO_2eq$ in 2030 which is closely related with the Sustainable Development Goals

[35] Judith Blau, '*The Paris Agreement: Climate Change, Solidarity, and Human Rights'*, (Switzerland: Palgrave Macmillan Imprint, 2017), Page 2–3.
[36] Streck, C., Keenlyside, P., & von Unger, M, *'The Paris Agreement: A New Beginning'*, Journal *f*or European Environmental & Planning Law 13(1), 3–29 (2016), Page 2.
[37] Ross.J Salawitch, Timothy P.Canty, et all., *'Paris Agreement: Beacon of Hope'*, (Switzerland: Springer Imprint, 2017), Page 121.
[38] Robert Falkner*, 'The Paris Agreement and The New logic of International Climate Politics',* Op.Cit, Page 11.

(SDGs) by United Nations (UN) on climate action or at least 40 $GtCO_2gt$ to keep the increase of global world temperature above than two degrees Celsius.[39]

Paris Agreement was also expected that 55 Parties among 196 parties should eliminate the greenhouse gases emission at least 55% in the total target of reduction. Therefore, the Paris Agreement is emphasizing the prospect of long-term goal on climate change mitigation through the target of Temperature Goal and Net Zero Emission in the second half of the century. National Determination Contributions (NDCs) was the setting agenda to achieve the long-term goal that has been mentioned on 2 Article and 4 (1) article of Paris Agreement. NDCs will be highlights the policy and the agenda of each country on greenhouse gas emission reduction which is more significant rather than on the Kyoto Protocol. Paris Agreement is also leaving each government to contribute on the collective action of climate change mitigation based on the capacity of the parties. As mentioned on the article 4 (9) of Paris Agreement, *NDCs are following actions that should be submitted and to be intervals on every five years, and NDCs is expected to raise climate ambition of the agreement, indeed to avoid the increasing of the world temperature beyond than 2 degrees Celsius and the global warming prospect of 2,7 degrees Celsius or more*.[40] On the third article of the Paris Agreement, NDCs are identified as the policy that submitted the specific agendas and projects on climate action of each government.[41]

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[39] Daniel Klein, Maria Pia Carazo, et all, '*The Paris Agreement on Climate Change*', Op.Cit, Page11.
[40] Robert Falkner, *'The Paris Agreement and the New Logic of International Climate Politics',* Page 11.
[41] Judith Blau, '*The Paris Agreement: Climate Change, Solidarity, and Human Rights'*, Page 23.

Through the commitment of keeping the global temperature and the removals of greenhouse gas emission target, *The Guardian* highlights Paris Agreement as "the world's greatest diplomatic success" and *New York Times* underlines Paris Agreement as "Landmark Agreement" in the history of climate change agreements. Basically, there are three objectives of the Paris Agreement that mentioned the link to the treaty of UNFCCC in 1992, (1) the prospect and target of sustainability on climate action, (2) the differentiation between developed countries and developing countries on climate action which is emphasize the responsibility of the rich countries to helping developing countries that have not largely responsible on climate change, (3) the protection of human rights of the peoples from environment destruction as stated on the opening remarks of Paris Agreement which is mentioning the common concern on climate actions as the following actions to protects human rights such as on the rights of health.[42]

Germany was known as one of the countries that had ratified Paris Agreement on October 2016 and had been adopted the agreement into Climate Action Plan 2050. Climate Action Plan 2050 was the NDCs of Germany as the implication of the ratification of Paris Agreement which mentioned in the article 4 (9) that included the following actions of Germany to achieve long-term target on Paris Agreement. Therefore, Climate Action Plan 2050 should be underlined as the policy to achieve the goals mentioned in article 2 and 4 (1) of the Paris Agreement as stated earlier. Through Climate Action Plan 2050, Germany committed to

[42] Ibid, Page 25.

keeping the increase of global temperature below than 2 degrees Celsius or 1,5 degrees Celsius and determined to reduce 95% of greenhouse gas emission by 2050.

Barbara Hendrick as the Federal Minister of Environment in Germany said that *"I am calmly confident that we will manage to put our economy on a large greenhouse gas emission neutral footing by 2050"*. Through the statement, the government is confident that Germany will be victorious to achieve the target as mentioned in the article of Paris Agreement by 2050. To complete the objective by 2050, In 2030 Germany is expected to reduce 55% greenhouse gas emission and 70% lower greenhouse gas emission by 2040 towards the goal of 95% lower greenhouse gas emission. [43] In total, the objective of lower greenhouse gas emission reduction between 2040 and 2050 was estimated around 374 and 62-250 million tons of CO2eq.[44] Climate Action Plan 2050 will be the landmark policy and the starting point of Germany's climate change mitigation.

2.1 The Climate Action Plan 2050

Germany has been known as the most significant contributor to greenhouse gas emission compared to other European Union countries due to the high industrialization and strength economic development performance (Table 2.1). But, Germany also one of the developed countries who had the lofty ambition of addressing climate change. Germany will play an important role to achieve the specific target in 2050 as stated on the Paris Agreement after decided to ratify the

[43] The Federal Government of Germany, '*Climate Action Plan 2050: Milestone on the Way to Modernising Germany'*, 2016, access on https://www.bundesregierung.de/breg-en/news/milestone-on-the-way-to-modernising-germany-388312 (23/11/2018. 11:00 WIB)
[44] Climate Scorecard, *'Germany's Climate Action Plan 2050'*, 2018, access on https://www.climatescorecard.org/2018/06/germanys-climate-action-plan-2050/ (23/11/2018, 11;20 WIB)

agreement on 5 October 2016. As mentioned in the official document of Federal Ministry for the Environment, Nature Conservation, Buiding and Nuclear Safety, the government of Germany had realized that 2015 is the crucial year and the turning point on addressing climate change as the global environment issue, therefore Climate Action Plan 2050 has been created to overcome the threats of climate change as mentioned on the draft of the Paris Agreement. Germany will be the role model of a developed country that committed on combating climate change by providing guidelines on Climate Action Plan 2050 to maximize the greenhouse gas emission reduction of 95% in the second half of this century

Table 1.1 [45]

Total Greenhouse gas emission of European Union Countries *CO_2 (Million tons of CO_2eq)*

European Union Countires	1990	1995	2000	2005	2010	2016	Total (%)
Belgium	149,8	157,7	154,5	149,0	136,9	122,1	2,8%
Bulgaria	104,7	75,5	59,8	64,5	61,1	59,7	1,3%
Czech Republic	200,1	159,4	150,8	149,0	141,5	131,3	3,0%
Denmark	72,2	80,2	73,1	68,9	65,8	53,3	1,2%
Germany	1.263,7	1.138,3	1.064,3	1.016.0	967,0	935,8	21,1%
Estonia	40,5	20,3	17,4	19,3	21,2	19,7	0,4%
Ireland	56,6	60,3	70,4	72,1	63,6	64,2	1,4%
Greece	105,6	111,8	128,9	138,9	121,0	94,7	2,1%
Spain	292,5	334,0	395,2	450,6	368,3	340,5	7,7%

[45] Eurostat, '*Greenhouse Gas Emission Statistics-Emission Inventories*', Page 3, access on https://ec.europa.eu/eurostat/statistics-explained/pdfscache/1180.pdf (23/11/2018. 13:00 WIB)

France	555,1	552,1	565,3	568,6	527,7	475,4	10,7%
Croatia	32,4	23,2	26,0	30,2	28,3	24,7	0,6%
Italy	522,7	539,5	562,5	589,4	512,9	438,2	9,9%
Cyprus	6,3	7,6	9,1	10,1	10,3	9,7	0,2%
Latvia	26,7	13,0	10,6	11,6	12,7	11,7	0,3%
Lithuania	48,5	22,4	19,5	23,0	20,9	20,4	0,5%
Luxembourg	13,2	10,7	10,6	11,6	12,7	11,7	0,3%
Hungary	94,3	76,0	74,1	76,6	66,1	62,1	1,4%
Malta	2,3	3,0	3,1	3,2	3,3	2,3	0,1%
Netherlands	225,9	238,9	229,4	225,4	223,7	207,0	4,7%
Austria	79,6	81,1	82,1	94,6	87,0	82,0	1,8%
Poland	467,9	438,9	390,4	398,6	407,4	397,8	9,0%
Portugal	61,5	72,1	85,4	89,3	72,8	71,2	1,6%
Romania	247,5	181,1	141,2	148,2	122,7	113,4	2,6%
Slovenia	18,7	18,8	19,1	20,6	19,7	17,8	0,4%
Slovakia	74,0	54,0	49,6	51,3	46,4	41,2	0,9%
Finland	72,3	72,8	71,2	71,1	77,2	60,8	1,4%
Sweden	72,9	75,0	70,6	68,7	66,5	55,5	1,2%

Source: European Environment Agency Data

Based on the table of 2.1 above, regarding the total emissions from each country in Europe mainly has been mentioned the position of Germany as the largest emitter among others between 1990-2016 with total emissions contribution around 21%. Therefore, the position of Germany is crucial in the region to achieve lower greenhouse gas emission that has been mentioned on the Paris Agreement and has been committed by the European Union.

Climate Action Plan 2050 has launched in 2016 by the Federal Government under the mandate of Federal Ministry for the Environment of Germany. The Climate Action Plan has been involved another actor including the associations, citizens, business into the process of dialogue on Climate Action Plan 2050. Climate Action Plan 2050 is created to achieve the prospects of sustainable development of economics in Germany which is still concerning on environmental threats of climate change by avoiding the production of greenhouse gas emission until the second half of this century. In the process of implementation of the climate action, the government of Germany has been given the mandate to the Federal Ministry for the Environment, Nature Conservation, Buiding and Nuclear Safety to set the specific plan and strategic started in 2016. Climate Action Plan 2050 provides the guidance and targets of each sector which are including on energy provision, transportation, buildings, industry, forestry, and agriculture to maximizing 95% of greenhouse gas emission target reduction in 2050 (Table 2.2).[46]

Table 2.2:

The target of lower greenhouse gas emission in 2030 on Climate Action Plan 2050

Areas of Action	1990 (In million tonnes	2014 (In million	2014 (Emission target in % from 1990)	2030 (In million tonnes of CO_2eq)	2030 (Emission reduction target in %

[46] federal Ministry for The Environment, Nature Conservation, Building and Nuclear Safety, *'Climate Action Plan 2050: Principles and Goals of the German Government's Climate Policy'*, Page 13, access on https://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutzplan_2050_en_bf.pdf (23/11/2018, 13:20 WIB)

	of CO_2eq)	tonnes of CO_2eq)			compared to 1990)
Energy Sector	466	358	23%	175-183	62-61%
Buildings	209	119	43%	70-72	67-66%
Transport	163	160	2%	95-98	42-40%
Industry	283	181	36%	140-143	51-49%
Agriculture	88	72	18%	58-61	34-31%
Sub Total	1209	890	69%	538-557	56-54%
Other	39	12		5	87%
Total	1248	902		543-562	56-55%

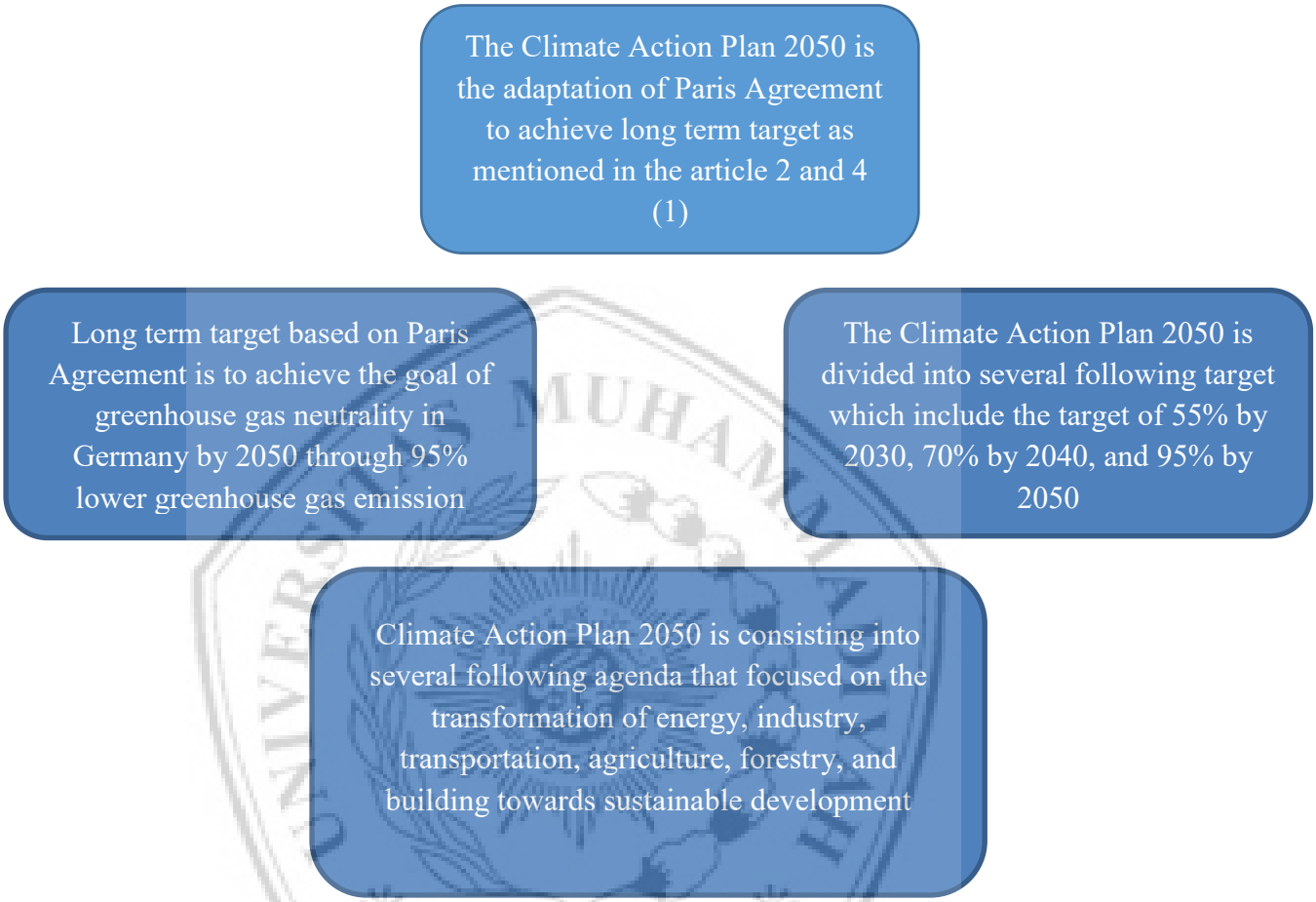
Source: Federal Ministry for Federal Ministry for the Environment, Nature Conservation, Buiding and Nuclear Safety in 2016
Note: based on the table description above, the forestry is not directly mentioned on greenhouse gas emission target of a reduction in 2030, but the government is still focused on the conservation and protection of forest to improve the capacity to carbon dioxide sinks in forest

The critical elements of Climate Action Plan 2050 are mentioning the long term-target on climate action to achieve the target of greenhouse gas neutrality within the country of 95% greenhouse gas emission reduction in 2050 which started to focus on greenhouse gas emission reduction in 2030 (Table 2.2). The policy also highlights the importance of principles constructions on the transformation of each sector. The climate action Plan 2050 will provide the target up to 2030 that should be achieved by 2050. In the process of implementation, the climate action has made the specific strategies of each sector by providing the establishment of a learning process to achieve the target of the Paris Agreement.[47]

[47] Ibid, Hal 6

Figure 1.3:

The Roadmap of Climate Action Plan



Source: Created by Writer

Climate Action Plan 2050 has been known as Germany's National Determinations Contributions (NDCs) to achieve the long-term goal on Temperature Goal and Net Zero Emission 2050 as the core of the Paris Agreement. Through the Climate Action Plan 2050, Germany's trying to keep the increase of greenhouse gas emission from energy, industry, buildings, transportation, agriculture, forestry and others sector. There are several important strategies to achieve the target of Climate Action Plan 2050, which are following some aspects: (1) The government has decided to set up the commission based on Federal Ministry

for Economic Affairs and Energy. The commission will be focus on the reduction of greenhouse gas emission based on economic perspective by providing the investments in every sector of Climate Action Plan 2050, (2) The climate action plan will be focus on renewable energy sources development by increasing the installation of renewable energy.[48]

The strategies of Climate Action Plan 2050 also mentioning others key elements: (3) In the transportation sector, the government of Germany will be focus to reduce the greenhouse gas emission by 2030 by addressing the CO_2 emissions from cars, light and heavy commercials vehicles, (4) The government also focus to reduce the greenhouse gas emission from industry sector which is focus on CO2 emissions, (5) Germany also will be focus to advocate the protection of forestry which is focus on the Joint Task for The Improvement of Agricultural Structure and Coastal Protection and funding areas of forest should be focus on combating the further risk of climate change, (6) The government also has been building the cooperation with Lander to maximize the target of greenhouse gas emission reduction from agriculture sector, (7) Last, the strategic will be focus on how the government will encourage the polluters to reduce their production of emissions and move towards the sustainable production on consumptions.[49]

2.2.1 Energy Sector

Renewable energy has been one of the priorities on climate change mitigation to avoid the further risk of climate change on the increasing of the world temperature,

[48] Ibid, Page 8
[49] Ibid, Page 8-9

rising sea levels, and extreme weather through the lower greenhouse gas emission target. Germany as one of the most significant contributors of greenhouse gas emission due to burning fossil fuels energy has committed on renewable energy since the 1990s through the framework of Energiewende to transform economic development into green economy towards climate change goals proposed by Paris Agreement at COP 21.[50] Between 2014 and 2015, the installation of renewable energy in Germany has risen from 27,4% to 32,6%. Through the development of renewable energy between 2014 and 2015, Germany has been victorious to avoid the growth of greenhouse gas emission number from 143 million tons in 2014 to 167,5 million tons in 2015.[51]

Therefore, based on the explanation above the energy sector is one of the main focus on Climate Action Plan 2050 following several aspects to develop the prospects of renewable energy development within the country. The renewable energy on Climate Action Plan 2050 also will highlight the massive number of greenhouse gas emission reduction due to 40% or around 358 million tons of CO_2 of Germany's greenhouse gas emission in 2014 are estimated coming from energy sector itself.[52] The renewable energy will decrease the dependence of Germany's energy on non-renewable sources including oil, coal, and natural gas which produced the large number of CO_2 released into the atmosphere towards renewable

[50] Berlin Energy Transition Dialogue, *'The Germany Energy Transition'*, 2016, Page 2, access on https://www.energiewende2018.com/wp-content/uploads/2016/03/BETD2016_Press_Factsheet_Layout_1603.pdf (23/11/2018, 14:10 WIB)
[51] Ibid, Page 7
[52] Federal Ministry for the Environment, Natur Conservation, Buiding and Nuclear Safety, *'Climate Action Plan 2050: Principles and Goals of the German Government's Climate Policy'*, Op.Cit, Page 34

sources such as wind power, hydropower, geothermal, biomass, Solar Photovoltaics (PV) and many more. Through develop of sustainable energy on renewable sources, the government's expected that renewable energy will be used in all sectors including buildings, transportations, and most specifically on industry through the consolidation of energy efficiency.

The development of renewable energy in Climate Action Plan 2050 has linked to the concept of *Energiewende* which is the plan of energy transition towards renewable energy within the country that started since the 1990s. With the target of greenhouse gas emission reduction in 2030, Energy Sector is expected to play a significant role on lower CO_2 to achieve the goal of 175 until 183 million tons of CO_2eq towards the target of 95% of greenhouse gas emission cut in 2050.[53]The government did realize that demand on energy will raise for transportation, buildings, and industry and others sector in the future, but the government has been created the specific framework to achieve *"efficient first"* principle to fulfill energy needs. The principle is emphasizing the way to limit the demand on non-renewable energy and ensure all of the energy needs based on renewable energy sources to achieve the target of electricity generation must be entirely on renewable sources by 2050.[54] The Federal Ministry for Economic Affairs and Energy has been set the framework for comprehensive consultation to achieve energy efficiency through the use of renewable energy sources within national economy and individual businesses. The discussion is addressing the

[53] Ibid, Page 36
[54] Ibid, Page 35

energy system in the future that should depend on renewable energy for the heating, transport and industry sector that will involve some actors including the government, business, and others. To achieve the target of 95% of lower greenhouse gas emission, the government of Germany is expected to cut the total energy consumption by 20% until 2020 and at 50% in 2050. Then, the final energy consumption on renewable energy is rise to 60% in 2050 compared from 14,9% in 2015.[55]

The energy sector was divided into two parts of Climate Protection Scenario which are including *Climate Change Scenario of 80%* greenhouse gas emission reduction and *Climate Change Scenario of 95%* lower greenhouse gas emission towards the target of Climate Action Plan 2050 goals. Inside the Climate Change Scenario of 80%, the renewable energy project will be a focus on wind power with the target of installations from 38 TWh into 344 TWh in 2050 and others renewable sources Photovoltaics or Solar power is expected will develop from 12 until 115 TWh. Then, the using of fossil fuels energy including oil, natural gas, and coal should be reduced to 26 TWh in 2050. Therefore the greenhouse gas emission reduction in the Climate Protection Scenario of 80% will be expected around 88% compared to 2010 or 91% compared to 1990.[56] In the Climate Change Scenario of 95% greenhouse gas emission reduction, renewable energy sources are expected to increase into 572 TWh in 2050 and Photovoltaics will grow into 123 TWh, and the

[55] Ibid, Page 39
[56] Oko-Institut eV, *'Climate Protection Scenario in 2050'*, 2016, Page 20, access on https://www.oeko.de/fileadmin/oekodoc/Climate-Protection-Scenario-2050-Summary.pdf. (25/11/2018, 19:00 WIB)

lower greenhouse gas emission on electricity production is predicted more than 96% compared to 2010 or 97% compared to 1990.[57] Based on the explanation, Wind and Solar will be the main focus on renewable sources to fulfill the electricity needs within the country due to the technology to develop both of sources is cost-effective potential.

There are several key strategies on transformation towards energy-neutrality through renewable energy development in Climate Action Plan 2050, (1) The government has been created National Plan on Energy Efficiency (NAPE) in December 2014 towards the target on Climate Action Plan 2050 to increasing the prospects of energy efficiency to cutting the CO_2 emissions, (2) The government also formulated Green Paper on Energy Efficiency which is drafted by Federal Ministry for Economic Affairs and Energy to achieve the target on reduction of energy consumption within the country, (3) In 2017, the government is drafted The 2017 Renewable Energy Sources Act to keep the costs of renewable energy sources as low as possible and controlling the possibility of expansion that supported by the local community energy projects to raising the awareness and support from the public for the Energiewende on Climate Action Plan 2050.[58] The government also focus on research and development on renewable energy sources to achieve the target on energy sector by 2030 and 2050 in Climate Action Plan 2050 through the

[57] Ibid, Page 21
[58] Ibid, Page 39

implementation of Energiewende. The research areas will be focus on renewable energy technologies to increase the energy efficiency.[59]

2.2.2 Building Sector

The building sector has been another critical key to the target of greenhouse gas emission reduction through Climate Action Plan 2050. The transformation of building area on climate action will be a focus on *Climate-neutral building stock* and *Climate-Friendly Buildings* on controlling electricity consumption, heat and cooling, and also the materials buildings on the construction at residential and non-residential buildings. The importance of ensuring the sustainable development prospect on building sector is related to the number of greenhouse gas emission that produced which have been estimated around 199 million tons of CO_2 in 2014. The goals of the government on climate action through building sector is not limited on climate change goals but also including the UN's Sustainable Development Goals *to make cities and human settlements inclusive, safe, resilient and sustainable* as stated on SDG 11.[60]

In the target of lower greenhouse gas emission by 2030 on Climate Action Plan 2050, the building sector is targeted to reduce the emissions of CO_2 around 70-72 million tons CO_2eq. Then, towards the target of 95% greenhouse gas emission or at least 80% cutting emissions by 2050, the government has been focused to ensuring the energy use in the manufacture and recycle buildings should

[59] Ibid, Page 40
[60] Federal Ministry for the Environment, Natur Conservation, Buiding and Nuclear Safety, *'Climate Action Plan 2050: Principles and Goals of the German Government's Climate Policy'*, Op.Cit, Page 40-41

be minimizing or reducing up to the target of 2030. To support the process of implementation on Climate Action Plan 2050 through the transformation of building sector which are including at residential and non-residential building, the government have been created several framework including funding programme on CO_2 Building Rehabilitation Programme, the Market Incentive Programme to promoting the use of renewable energy, and providing the funding or financial aids for climate-friendly buildings.[61] All of those following frameworks will be the guide during the process of building sector transformation to avoid the further risk of climate change.

Climate change mitigation based on buildings sector are not only requires the renewable energy use in households and manufacture to reduce the burning fossil fuels energy consumption towards low emissions target, but the government also has been expected the expansion of sustainable towards buildings materials to consider the impact of the construction especially on the environment. Renewable Energy is the key to cutting emissions from buildings sector, therefore in the process to increase the high demand on renewable energy into each building, the government has been connected into the center of information and communication technology. Through information and communication technology, the energy efficiency in buildings will be integrated to the public and they can control the number of energy consumption to fulfill energy needs on lighting, cooling, heat, and electricity.[62]

[61] Ibid, Page 45-46
[62] Ibid, Page 45

2.2.3 Transportation Sector

The transportation sector has been taken responsible for 160 million tons CO_2eq emissions in 2014 or accounted into 18% of total greenhouse gas emission by Germany. The transportation was one of the sectors that depend on fossil fuels energy which is oil, in 2014 90% transport is oil based and Germany imported on oil reached into 50 Billion euros to fulfill energy needs on transportation sector such as cars, motorcycles and public transportation. Therefore, since 2014 Germany has been focused on the transformation of transportation towards sustainable development which is started from Climate Action 2020. In Climate Action programme of 2020, emissions of carbon dioxide that produced by transportation sector should be reduced around 137 million tons of CO_2eq or at least 16% from total emissions of 163 Million CO_2eq in the 1990s.[63] Then, in Climate Action Plan 2050, the greenhouse gas emission reduction target based on transportation areas is expected to reduce around 40-42% from total emissions in 1990s levels as mentioned in table 2.2.

Emphasizing a large number of greenhouse gas emission produced by the transportation sector, the government is highlighting the energy transitions towards renewable energy to decrease the depends on fossil fuels energy on transportation. Then, the government also focus on setting the new vehicles for future generations that will reduce the number of pollutants and the release of CO_2 into the atmosphere. Through the reduction of greenhouse gas emission by the transportation in road traffic which are including train, cars, motorcycles to achieve the target of vehicle

[63] Ibid, Page 49

efficiency on energy use towards renewable energy, the government is expected to reduce 95-98 million tons of CO_2 by 2030 as the process towards the target of 95% greenhouse gas emissions reduction target by 2050.[64]

In the process of implementation, the German Automobile Industry has cooperated with the government to achieve the lower greenhouse gas emissions from cars as soon as possible by 2030 and 2050 through the formulation of new technologies that will save the greenhouse gas emission per-vehicle kilometers. In the process of the development of new technology to hold to the growing number of greenhouse gas emission, the German Automobile Industry has spent 15 Billion Euros on the investment towards the development of electric mobility.[65] Besides that, the German on Climate Action Plan 2050 based on the transportation sector also focus on research and development and put into the process the financial aids that accounted for around 2,6 billion euro.[66] To achieve long-term target on Temperature Goal and Net Zero Emission as stated on the Paris Agreement, the government will increase the number of public transport to pushing out CO2 emissions as soon as possible.

There are several important strategies towards the transformation of transportation sector to achieve the target of lower greenhouse gas emission on Climate Action Plan 2050, (1) The government has been developed the new concept of *Learning Strategy* on the development Energiewende that will be installed on

[64] Ibid, Page 52
[65] Ibid, Page 53
[66] Ibid

transportation sector to reduce the fossil fuels energy, (2) In the process of installation of renewable energy on transportation sector, the government along with the National Hydrogen and Fuel Cell Technology is preparing the innovation programme on Energiewende, (3) The government also focus on developing the alternative fuel energy which is Hydrogen to keep the growing number of greenhouse gas emission.[67]

2.2.4 Industry Sector

As one of the developed country, the Industry sector has been taken responsible for direct emissions from the process of industrialization and economic transaction including on trade, commerce, and services in Germany. In 2014, the emissions of CO_2 from industry accounted around 180 million tons CO_2eq or estimated of 20% of total greenhouse gas emission in Germany in 2014. Therefore, on Climate Action 2050, the industry has been one of the crucial sectors that should be taken towards the target of 95% lower greenhouse gas emission in the second half of this century. In the process of transformation of industry sector, the government of Germany has cooperated with various stakeholders who are including the large companies, small-median enterprise toward the strategy to modernize Germany's industry to achieve the sustainable development on climate action and also sustainable consumption and production patterns as stated on SDG 12.[68]

The transformation of the industry sector on Climate Action Plan 2050 is expected to reduce the greenhouse gas emission of Carbon Dioxide between 140 and 143 million tons of CO_2eq. The government on climate action through industry

[67] Ibid, Page 54
[68] Ibid, Page 57

sector also focus on high-efficiency strategy to reduce the use of resources and energy needed on the process of industrialization and production which environmental management must be taken as the priority. Through National Action Plan on Energy Efficiency or NAPE, the government will be a focus to provide the planning to cut the number of energy use and resources on the process production. The European Union Emission Trading System will be the key on climate action based on energy sector which is emphasizing the reduction of greenhouse gas emission of all Europe countries to meet the target by 2050 of Paris Agreement.[69] Under the Federal Ministry for The Environment, Nature Conservation, Building, and Nuclear Safety to maximize the electricity efficiency on industry sector the government released the project which is called as *STEPup* to reduce the use of non-fossil fuels energy.[70]

Germany is extending the useful of lives of products and avoiding the high number of waste as one of climate action on industry and business sector. There are three important strategies towards the program, (1) the government will be focus to encourage the companies to repair the products and ensuring on how long the products will be expired, (2) At regional level, Germany will support the process of identification through providing information of repair products to avoid the growing number of waste as one the cause of CO_2 emissions, (3) The government has set the framework of Waste Prevention programme in 2019 to prevent the

[69] Ibid, Page 59
[70] Federal Ministry for Environment, Nature Conservation, Buidling and Nuclear Safety, *'Climate Action in Figures-Facts, Trends, and Incentives for German Climate Policy'*, 2018, Page 34, access on https://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutz_in_zahlen_2018_en_bf.pdf. (25/11/2018. 23:33 WIB)

emissions from waste due to process of production on industry and business activities.[71]

2.3.5 Agriculture Sector

Agriculture has been taken responsibility of 8% of total greenhouse gas emission in Germany in 2014 or estimated around 72 million tons of CO_2. The greenhouse gas emission by agriculture sector are including the emission from the use of nitrogen which estimated around 25 million tons of CO2eq, methane emission with the total number of 25 million tons emissions of CO2eq, emission from slurry management accounted into 10 million tons of CO2eq and greenhouse gas emission from fuel in agriculture machinery and vehicles estimated around 6 million tons of CO2eq emissions.[72] Then, in 2016 around 7,8% of total greenhouse gas emission in Germany were coming from the agriculture sector that included the emission of CO2, CH4, and N20 that impacted climate change itself. [73]

In Climate Action Plan of 2050, the agriculture sector is expected to achieve the target of lower greenhouse gas emission by 2030 around 58 to 61 million tons of CO_2eq compared to the levels of the 1990s. In the process of implementation towards the target of 2030 on Climate Action Plan 2050, the government will be focus to reduce the use of nitrogen on agriculture into 70 kilogram per hectare due

[71] Federal Ministry for The Environment, nature Conservation, Building and Nuclear Safety, '*Climate Action Plan 2050: Principles and Goals of the German Government's Climate Policy'*, Op.Cit, Page 60
[72] Ibid, Page 62
[73] Federal Ministry for The Environment, Nature Conservation, Building and Nuclear Safety, *'Climate Action in Figures-Facts, Trends, and Incentives for German Climate Policy'*, Op.Cit, Page 48

to the high number of greenhouse gas emission that produced by nitrogen.[74] At the regional level, the climate action through agriculture has linked into the concept of "greening" project that produced by European Union countries to ensuring the sustainability and environmental-friendly concept on the environment. Besides that, the government also connected with the project on agriculture to addressing climate change under European Union Common Agriculture Policy (CAP) to ensuring the lower greenhouse gas emission should be achieving at the regional as soon as possible in the second half of this century. CAP will create the framework towards climate change mitigation target.[75]

There are several strategies to meet the target of lower greenhouse gas emission by 2050 on Climate Action Plan, (1) The government has been focused to develop the project which called as "*Too good for the bin"* campaign to reduce the CO_2 emissions from food waste and losses on agriculture, (2) Organic farming will be another important key to achieve the target of greenhouse gas emission reduction towards sustainable development project which not only focus on climate action but also to end the poverty and ensuring the food security as stated on SDG, (3) The government is also building a cooperation to setting a new framework on agriculture that will be focus on future organic farming and reducing the emissions from livestock farming due to the production of animal-based food has been one of the largest contributors of CO2 emissions from agriculture sector .[76]

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[74] Federal Ministry for The Environment, nature Conservation, Building and Nuclear Safety, *'Climate Action Plan 2050: Principles and Goals of the German Government's Climate Policy'*, Op.Cit, Page 63
[75] Ibid, Page 64
[76] Ibid.

2.2.6 Forestry Sector

Forestry was one the major emitter on greenhouse gas emission along with others sector including energy, industry, transportation and agriculture. Before the ratification of the Paris Agreement in 2015, emission from forestry has been estimated 11% from total global greenhouse gas emission. Therefore, one of the main mitigation of climate change towards the target of temperature goal and net zero emission by the Paris Agreement, the forest is an important agenda to meet the target as soon as possible. [77]Under the Federal Ministry for Economic and Development, the government of Germany has been continued the programme of forest conservation and management to achieve the target in 2030 on Climate Action Plan 2050.[78]

Therefore, the forestry sector was one of the important strategies to achieve the target of Climate Action Plan 2050 to saving the carbon emissions from the forest. In 2014, the greenhouse gas emission from the forestry sector estimated around 58 million tons of CO2eq due to the high number of illegal logging and wood products. To achieve the target of greenhouse gas emission reduction, the following actions towards the target is including the reduction of consumption and production of wood materials for industry sector, energy sector, or transportation.[79]The main focus on the transformation of the forestry sector towards

[77] Federal Ministry for Economic Cooperation and Development, 'The World Needs Forests: Germany's Forest Action Plan for Sustainable Development', 2016, Page 15, access on https://www.bmz.de/en/publications/topics/climate/Materialie283_forest_action_plan.pdf. (25/11/2018. 23:40 WIB)
[78] Ibid, Page 19
[79] Federal Ministry for Environment, Nature Conservation, Bulding and Nuclear Safety, '*Climate Action Plan 2050: Principles and Goals of the German Government's Climate Policy'*, Op.Cit, Page 67.

sustainable development and friendly on the environment is to create specific guidelines and framework for improving the capacity of the forest to maintaining the number of greenhouse gas emission. The Climate Action Plan 2050 is cooperating with the Intergovernmental Panel on Climate Change (IPCC) on forest conservation and forest management to reduce the number of CO_2 emissions from the forestry sector. Then, the Federal Ministry of Food and Agriculture of Germany also planned towards the sustainable use of wood to achieving climate action target for example as the sources of renewable energy due to in 2014 the development of biogenic solid fuels energy reduce emissions of CO_2 in Germany around 31 million tons of CO_2eq.[80]

[80] Ibid